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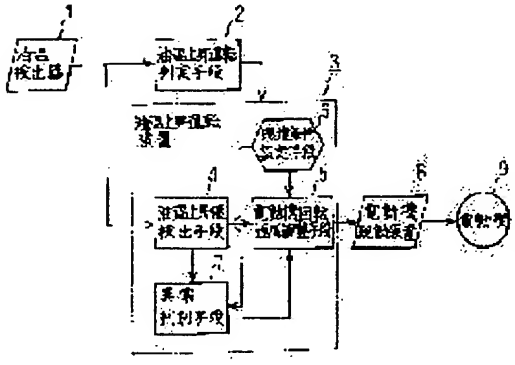
(54) OIL TEMPERATURE INCREASE RUNNING DEVICE OF HYDRAULIC ELEVATOR



(57)Abstract:
PROBLEM TO BE SOLVED: To perform stable oil temperature increase running and quiet oil temperature increase running at night.
SOLUTION: An oil temperature detector 1 detects an oil temperature and an oil temperature increase value detecting means 4 detects an oil temperature increase value. An electric motor rotational speed adjusting means 5 controls the rotational speed of an electric motor 9 based on the detected oil temperature increase value. The rotational speed of the electric motor 9 is reduced by 1/2 at night by an environment condition setting means 6 and control is performed by a time two times as that for the daytime. Thus, an oil temperature is increased without being affected by a room temperature and no adverse effects are given to a surrounding environment.

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CLAIMS

[Claim(s)]
[Claim 1] If the oil-temperature detector which carried out adjustable-speed operation of the hydraulic pump with the motor immersed in the oil tank, was made to go up and down the cage of a hydraulic lift, and was installed into the above-mentioned oil detects the oil temperature below a predetermined value The oil-temperature rise driving device of the hydraulic lift characterized by having a motor rotational-speed adjustment means to control the rotational speed of the above-mentioned motor based on the oil-temperature rise value under above-mentioned oil-temperature rise operation, in the equipment which the above-mentioned motor is separated [equipment] from the above-mentioned hydraulic pump, is driven [equipment], and raises the above-mentioned oil temperature.
[Claim 2] The oil-temperature rise driving device of the hydraulic lift according to claim 1 characterized by establishing an environmental condition setting means to set up the environmental condition which makes the rotational speed of the motor at the time of oil-temperature rise operation change.
[Claim 3] The oil-temperature rise driving device of the hydraulic lift according to claim 1 characterized by establishing an environmental condition setting means to set up the environmental condition which makes rotational speed of the motor at the time of oil-temperature rise operation a value lower than the time of the usual oil-temperature rise operation.
[Claim 4] The oil-temperature rise driving device of the hydraulic lift according to claim 1 characterized by establishing an environmental condition setting means to set up the environmental condition which makes rotational speed of the motor at the time of oil-temperature rise operation a value lower than the time of the usual oil-temperature rise operation, and makes it long duration rather than the time of the above-mentioned usual oil-temperature rise operation.
[Claim 5] The oil-temperature rise driving device of the hydraulic lift according to claim 1 characterized by establishing an abnormality distinction means to distinguish from the abnormalities of the above-mentioned oil-temperature rise operation if the oil-temperature rise value under oil-temperature rise operation comes outside the predetermined range.
[Claim 6] The oil-temperature rise driving device of the hydraulic lift according to claim 5 characterized by establishing an abnormal-stop command means to output the command which stops a motor when the abnormality distinction means distinguished abnormalities.
[Claim 7] If the oil-temperature detector which carried out adjustable-speed operation of the hydraulic pump with the motor immersed in the oil tank, was made to go up and down the cage of a hydraulic lift, and was installed into the above-mentioned oil detects the oil temperature below a predetermined value In the equipment which the above-mentioned motor is separated [equipment] from the above-mentioned hydraulic pump, is driven [equipment], and raises the above-mentioned oil temperature The oil-temperature rise driving device of the hydraulic lift characterized by having an oil-temperature rise value detection means to detect the oil-temperature rise value under above-mentioned oil-temperature rise operation, and a motor rotational-speed adjustment means to change the command value of the rotational speed of the above-mentioned motor with the oil-temperature rise value by which detection was carried out [above-mentioned].
[Claim 8] If the oil-temperature detector which carried out adjustable-speed operation of the hydraulic pump

with the motor immersed in th[redacted] tank, was made to go up and down the cage of a hydraulic lift, and was installed into the above-mentioned oil detects the oil temperature below a predetermined value In the equipment which the above-mentioned motor is separated [equipment] from the above-mentioned hydraulic pump, is driven [equipment], and raises the above-mentioned oil temperature An oil-temperature rise value detection means to detect the oil-temperature rise value under above-mentioned oil-temperature rise operation, An environmental condition setting means to set up the environmental condition which makes the rotational speed of the above-mentioned motor at the time of the above-mentioned oil-temperature rise operation change, A motor rotational-speed adjustment means to change the command value of the rotational speed of the above-mentioned motor according to the temperature rise value by which detection was carried out [above-mentioned], and the environmental condition by which a setup was carried out [above-mentioned], The oil-temperature rise driving device of the hydraulic lift characterized by having an abnormality distinction means to change the above-mentioned predetermined range according to the environmental condition by which a setup was carried out [above-mentioned] while distinguishing from the abnormalities of the above-mentioned oil-temperature rise operation, when the oil-temperature rise value under above-mentioned oil-temperature rise operation came outside the predetermined range.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the equipment which carries out oil-temperature rise operation at the time of the temperature fall of an oil which drives a hydraulic lift.
[0002]
[Description of the Prior Art] Generally, with a hydraulic lift, if the temperature of an oil changes, the viscosity of an oil will change, and if an oil temperature falls, viscosity will become high. Thereby, damage on devices, such as a hydraulic pump, is caused, or the ullage and mechanical efficiency of a hydraulic pump change and the load torque to a motor and the speed of response of a check valve are changed. For this reason, a means to operate fixed time amount oil-temperature rise equipment, and to raise an oil temperature when an oil temperature is low is **********.
[0003] In recent years, in connection with the technical progress of a semi-conductor, an electrical potential difference and a frequency are changed and the method which controls the rotational speed of an induction motor over the large range is adopted widely. The oil-temperature rise equipment which carries out oil-temperature rise operation by this motor rotational-speed control system is indicated by JP,3-158375,A. This connects the hydraulic pump of an induction motor with an electromagnetic clutch, the rotational speed of a hydraulic pump is usually controlled through an electromagnetic clutch at the time of operation, by intercepting an electromagnetic clutch, only an induction motor is driven at the time of an oil-temperature fall, and it raises an oil temperature using generation of heat of a motor, and the rotation loss energy of an oil.
[0004]
[Problem(s) to be Solved by the Invention] If low temperature is detected, he is trying to operate fixed time amount oil-temperature rise equipment in the above oil-temperature rise driving devices of the conventional hydraulic lift. However, when room temperatures, such as Nighttime and winter, are low, even if an oil temperature cannot rise easily and it operates oil-temperature rise equipment compared with the time when a room temperature is high, an oil temperature ends oil-temperature rise operation so much from a low-temperature disregard level, not rising. Moreover, since an oil temperature tends to fall when an elevator is stopped, the trouble of repeating oil-temperature rise operation repeatedly is for a short time.

[0005] Moreover, when oil-temperature rise operation is repeated in the case of Nighttime, there is a trouble that noise, such as a rotation sound of a motor and a sound of magnetic contact of operation, affects a sitting-room. On the other hand, where low temperature is detected, when an oil-temperature detector breaks down, it is continued, an oil temperature turns into an elevated temperature too much conversely, and oil-temperature rise operation has the trouble of doing damage to a hydraulic-circuit device.
[0006] It aims at offering the oil-temperature rise driving device of the hydraulic lift which this invention was made in order to cancel the above-mentioned trouble, and it can carry out stable oil-temperature rise operation, and enabled it to carry out quiet oil-temperature rise operation to night.
[0007]
[Means for Solving the Problem] The oil-temperature rise driving device of the hydraulic lift concerning the 1st invention of this invention controls the rotational speed of the motor separated from the hydraulic pump at the time of low-temperature detection based on the oil-temperature rise value under oil-temperature rise operation.
[0008] Moreover, the oil-temperature rise driving device of the hydraulic lift concerning the 2nd invention changes the rotational speed of the motor at the time of oil-temperature rise operation by the environmental condition in the thing of the 1st invention.
[0009] Moreover, the oil-temperature rise driving device of the hydraulic lift concerning the 3rd invention is made to make rotational speed of the motor at the time of oil-temperature rise operation a value lower than the time of the usual oil-temperature rise operation by the environmental condition in the thing of the 1st invention.
[0010] Moreover, in the thing of the 1st invention, the oil-temperature rise driving device of the hydraulic lift concerning the 4th invention makes rotational speed of the motor at the time of oil-temperature rise operation a value lower than the time of the usual oil-temperature rise operation, and is made to make it long duration by the environmental condition.
[0011] Moreover, in the thing of the 1st invention, the oil-temperature rise driving device of the hydraulic lift concerning the 5th invention will be distinguished from the abnormalities of oil-temperature rise operation, if the oil-temperature rise value under oil-temperature rise operation comes outside the predetermined range.
[0012] Moreover, if the abnormalities of oil-temperature rise operation are distinguished, it is made for the oil-temperature rise driving device of the hydraulic lift concerning the 6th invention to stop a motor in the thing of the 5th invention.
[0013] Moreover, the oil-temperature rise driving device of the hydraulic lift concerning the 7th invention detects the oil-temperature rise value under oil-temperature rise operation, and changes the command value of the rotational speed of the motor separated from the hydraulic pump with the oil-temperature rise value by which detection was carried out [above-mentioned].
[0014] Moreover, the oil-temperature rise driving device of the hydraulic lift concerning the 8th If the oil-temperature rise value under oil-temperature rise operation is detected, the command value of the rotational speed of the motor separated from the hydraulic pump is changed according to the oil-temperature rise value by which detection was carried out [above-mentioned], and the set-up environmental condition and an oil-temperature rise value comes outside the predetermined range While distinguishing from the abnormalities of oil-temperature rise operation, the above-mentioned predetermined range is changed according to the set-up environmental condition.
[0015]
[Embodiment of the Invention] Drawing 1 - drawing 4 are drawings showing the gestalt of 1 implementation of this invention, for drawing 1 , an important section functional block diagram and drawing 2 are [a control circuit Fig. and drawing 4 of a whole block diagram and drawing 3] operation flow charts, and the same sign shows the same part among drawing.
[0016] The oil-temperature detector with which 1 was prepared in the oil tank 16 (drawing 2) of a hydraulic lift in drawing 1 , An oil-temperature rise operation judging means for 2 to be connected to the oil-temperature detector 1, and to judge implementation of oil-temperature rise operation based on an oil-temperature rise value, The oil-temperature rise driving device with which 3 carries out oil-temperature rise operation, an oil-temperature rise value detection means by which 4 detects an oil-temperature rise value for the oil-temperature data from the oil-temperature detector 1 as compared with the oil-temperature data in front of predetermined time, 5 is a motor rotational-speed adjustment means to order it the rotational speed of the motor under oil-temperature rise operation with the oil-temperature rise value from the

oil-temperature rise value detection means 4.
[0017] An environmental condition setting means to set up whether 6 is Nighttime for which the environmental situation of a current hydraulic lift, for example, the time amount which carries out oil-temperature rise operation, needs ****, and an environmental condition, and to output to the motor rotational-speed adjustment means 5, An abnormality distinction means for 7 to judge the existence of abnormalities based on the oil-temperature rise value outputted from the oil-temperature rise value detection means 4, and the environmental condition outputted from the environmental condition setting means 6, and to send out a command to the motor rotational-speed adjustment means 5, 8 is a motor driving gear which drives the motor 9 shown in drawing 2 by the command of the motor rotational-speed adjustment means 5.
[0018] The converter which R, S, and T change the three-phase alternating current into a three-phase-alternating-current power source, and changes 11 into a direct current in drawing 2 , The smoothing capacitor by which 12 was connected to the direct-current side of a converter 11, the inverter which 13 is connected to a smoothing capacitor 12 and changes a direct current into the three-phase alternating current of an adjustable electrical potential difference and a variable frequency, The converter for regeneration by which 14 returns the regeneration power from an inverter 13 to AC power supply R, S, and T, and 15 are main contact which is inserted between an inverter 13 and a motor 9, and supplies and intercepts the output of an inverter 13.
[0019] 16 is the oil tank in which the oil for a hydraulic lift drive is stored, and it is immersed by the motor 9 and the oil-temperature detector 1 into the oil of an oil tank 16. The hydraulic pump with which 17 was combined with the motor 9 through the electromagnetic clutch 18, the solenoid valve which is connected to a hydraulic pump 17 for piping, drives 19 by solenoid 19a, and controls the flow of an oil, piping by which 20 was connected to the oil hydraulic cylinder (not shown) from the solenoid valve 19, and 21 are the control devices which consisted of microcomputers, and are connected to an electromagnetic clutch 18, solenoid 19a, and the oil-temperature detector 1.
[0020] The low-temperature detection contact at which + and - will close a direct-current control power source and 25a in drawing 3 if it operates with the output of the oil-temperature rise operation judging means 2 and predetermined low temperature is detected, the low-temperature detection contact which similarly opens 25b, and 26 are low-temperature detection relays. Similarly 26a and 26b of the normally open contact and 26c are [a normally-closed contact and 27] the oil-temperature rise time limiting relays of a time-lag return form, the Nighttime detection contact which closes 27a and 27b at the normally open contact, and closes 28 at Nighttime, and 29 are the extended time limiting relays of a time-lag return form, and 29a is the normally open contact.
[0021] Malfunction detection relay contact which will be opened if 30 is always closed and abnormalities are distinguished with the abnormality distinction means 7, and 31 are oil-temperature rise equipment equivalent to the oil-temperature rise driving device 3.
[0022] Next, although actuation of the gestalt of this operation is explained, drawing 2 usually explains the actuation at the time first. At the time of usual, an electromagnetic clutch 18 is energized by the command from a control device 21, it operates, and the motor 9 and the hydraulic pump 17 are combined. If main contact 15 is energized at the time of starting and a control command is given to an inverter 13, the power which was changed into the direct current by the converter 11, and was changed into the alternating current with the inverter 13 will be supplied to a motor 9.
[0023] Now, a motor 9 drives a hydraulic pump 17 through an electromagnetic clutch 18, and the oil in an oil tank 16 is supplied to an oil hydraulic cylinder through a solenoid valve 19 and piping 20, and raises a cage (not shown). Solenoid 19a is energized by the command from a control device 21 at the time of descent of a cage, and a solenoid valve 19 switches the passage of an oil. Now, an oil is returned to an oil tank 16 from an oil hydraulic cylinder, and a cage is dropped. And the rise-and-fall rate of a cage is controlled by controlling the rotational speed of a motor 9 according to a predetermined transit pattern at the time of a rise of a cage and descent.
[0024] Next, drawing 1 - drawing 3 explain the actuation at the time of oil-temperature rise operation. The oil temperature TH from the oil-temperature detector 1 measured last time at step S1 is made into an oil temperature THB last time, and this input value is newly set as an oil temperature TH. An oil temperature TH judges whether it is below oil-temperature rise initiation temperature at step S2, if it progressed to step S3 and low-temperature detection contact 25a was closed, when it was the following, and it has exceeded, it will progress to step S4 and low-temperature detection contact 25a will be opened.
[0025] It judges whether the low-temperature detection relay 26 is energized at step S5. Since

low-temperature detection contact 25a closes at step S3 when an oil temperature is low, the low-temperature detection relay 26 is energized, and Contacts 26a and 26b are closed and open contact 26c. On the other hand, the oil-temperature rise time limiting relay 27 is energized in the circuit of (+)-(25b)-(26c)-(27)-(-) at the time of usual, and is closing Contacts 27a and 27b. For this reason, self-hold of the low-temperature detection relay 26 is carried out by closing of contact 26a. Moreover, the oil-temperature rise time limiting relay 27 is de-energized by disconnection of contact 26c, and starts the count of the time limit by it. This time limit is set as time amount required to raise an oil temperature.

[0026] Moreover, since malfunction detection relay contact 30 is closed, if contact 26b closes, oil-temperature rise equipment 31 will operate. That is, a motor 9 is separated from a hydraulic pump 17, and rotates a control device 21 in order to de-energize an electromagnetic clutch 18. Now, an oil temperature rises gradually with generation of heat of a motor 9, and the rotation loss energy of an oil. This is oil-temperature rise operation. And if predetermined time passes, the oil-temperature rise time limiting relay 27 will return, and contact 27a will open it.

[0027] If an oil temperature is higher than oil-temperature rise initiation temperature at this time, since low-temperature detection contact 25a is also opened wide, the low-temperature detection relay 26 is de-energized, and Contacts 26a and 26b are opened wide, and close contact 26c. By disconnection of contact 26b, oil-temperature rise equipment 31 serves as non-actuation, and a motor 9 stops and it ends oil-temperature rise operation.

[0028] Now, if judged with the low-temperature detection relay 26 being de-energized at step S5, oil-temperature rise operation will not be performed, but it will progress to step S18, and the initial value flag SYOKI will be set as "0" as initial setting. When the low-temperature detection relay 26 is energized, it progresses to step S6, and it judges whether it is in early stages of oil-temperature rise processing. If it is the first stage, for "0", the initial value flag SYOKI will progress to step S7, will initialize rotational speed N to alpha, and will set the initial value flag SYOKI as "1." alpha is a rotational speed required to suppose that the flow chart of drawing 4 is processed for every minute, and raise it in 10 minutes from 15 degrees C (oil-temperature rise initiation temperature) of oil temperatures to 25 degrees C. Then, it progresses to step S13.

[0029] If the initial value flag SYOKI is "1" at step S6, it will progress to step S8, the difference of this oil temperature TH and the last oil temperature THB will be calculated, and it will consider as the temperature rise value THD. Since the oil temperature is not rising in spite of judging whether the temperature rise value THD is lower than the predetermined value THS (for example, zero) at step S9, and carrying out oil-temperature rise operation, if low, it is judged as failure of oil-temperature detector 1 grade. And it progresses to step S10 and malfunction detection relay contact 30 is opened. Now, oil-temperature rise equipment 31 serves as non-actuation, and ends oil-temperature rise operation.

[0030] If the temperature rise value THD is beyond the predetermined value THS in step S9, it will progress to step S11, malfunction detection relay contact 30 will be closed, and oil-temperature rise operation will be continued. Next, it progresses to step S12 and the rotational speed N of a motor 9 is calculated by x(1/THD) N. For example, if it goes up by 1 degree C the 1st period (for example, 1 minute), rotational speed N will be set to alpha by the temperature rise value THD by 1 (initial value is N=alpha). If the temperature rise value THD is 0.5 the 2nd period, the value which doubled the rotational speed of the 1st period two will consider as the rotational speed (2xalpha) in the 2nd period.

[0031] It judges whether it is the time zone of Nighttime at step S13, when it is not Nighttime, it progresses to step S14, and the Nighttime detection contact 28 is opened wide, the rotational speed of a motor 9 is set as N at step S15, and the predetermined value THS is set as beta (predetermined value for a check of a temperature rise). Next, in the time zone of Nighttime, the operating frequency of an elevator is small. Moreover, when a sitting-room is near the machine room, it worries about noise, such as a rotation sound of a motor 9, and a sound of magnetic contact of operation. Then, if judged as the time zone of Nighttime at step S13, it progresses to step S16 and the Nighttime detection contact 28 is closed, and the rotational speed N of a motor 9 will be set as one half, and will be controlled by step S17. Moreover, the predetermined value THS is set as beta/2.

[0032] If rotational speed N of the Nighttime motor 9 is set to one half, since the temperature rise value THD will also be set to one half, this prevents carrying out malfunction detection by step S9 and S10. Moreover, the extended time limiting relay 29 is energized by closing of the Nighttime detection contact 28, and contact 29a closes by it in the circuit of (+)-(27b)-(28)-(29)-(-). Now, the low-temperature detection relay 26 continues self-hold. That is, although the oil-temperature rise time limiting relay 27 will serve as

non-actuation if predetermined [redacted]e expires, and contact 27a opens, the low-temperature detection relay 26 is not de-energized by closing of contact 29a.
[0033] Now, actuation is continued, the oil-temperature rise time limit is extended, and Nighttime is the rotational speed of the one half of the time zone of day ranges, and by performing oil-temperature rise operation over twice as many time amount as this, oil-temperature rise equipment 31 also reduces by half the rotation sound of a motor 9, and the count of actuation of magnetic contact, and reduces the noise given to a perimeter environment. here -- step S8 -- the oil-temperature rise value detection means 4 -- step S9 -- the abnormality distinction means 7 -- in step S10, steps S12, S14-S17 constitute the motor rotational-speed adjustment means 5, and step S13 constitutes the environmental condition setting means 6 for the abnormal-stop command means.
[0034] Although the time when the temperature rise value THD is smaller than the predetermined value THS shall be distinguished from abnormalities in step S9 of drawing 1 , it will become still more desirable, if it is made to distinguish from both abnormalities when the temperature rise value THD is smaller than the predetermined range, and when large. Moreover, although the configuration including a relay circuit explained with the gestalt of the above-mentioned implementation, it is also possible to constitute all from software and it is clear that the same effectiveness is acquired. Moreover, it is also possible to change the oil-temperature rise initiation temperature of step S2 of drawing 1 according to the conditions set up with the environmental condition setting means 6.
[0035]
[Effect of the Invention] Since the rotational speed of a motor was controlled by the 1st invention and the 7th invention of this invention based on the oil-temperature rise value as explained above, it is effective in the ability to raise an oil temperature to constant temperature by fixed time amount, without being influenced of a room temperature.
[0036] Moreover, in the 2nd invention, since the rotational speed of the motor at the time of oil-temperature rise operation was changed by the environmental condition, it is effective in the ability to perform oil-temperature rise operation which does not have a bad influence on a perimeter environment.
[0037] Moreover, in the 3rd invention, in order to make rotational speed of the motor at the time of oil-temperature rise operation into a value lower than the time of the usual oil-temperature rise operation and to make it into a long time further by the 4th invention by the environmental condition, the rotation sound of a motor and the count of actuation of magnetic contact are mitigated, and there is effectiveness which can maintain a quiet environment also at night.
[0038] Moreover, in the 5th invention, since it was made to distinguish from the abnormalities of oil-temperature rise operation when the oil-temperature rise value under oil-temperature rise operation came outside the predetermined range, it is effective in abnormalities, such as an oil-temperature detector and oil-temperature rise equipment, being detectable.
[0039] Moreover, in the 6th invention, since it was made to stop a motor when the abnormalities of oil-temperature rise operation were distinguished, useless oil-temperature rise operation is carried out, or it is effective in the ability to prevent damaging a device.
[0040] Moreover, in the 8th invention, since the range of abnormality distinction was changed according to the environmental condition while distinguishing from the abnormalities of oil-temperature rise operation when the rotational speed of the motor at the time of oil-temperature rise operation was changed according to the oil-temperature rise value and the environmental condition and the oil-temperature rise value came outside the predetermined range, it is effective in oil-temperature rise operation stabilized further being realizable.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The important section functional block diagram showing the gestalt of 1 implementation of this invention.

[Drawing 2] The whole block diagram showing the gestalt of 1 implementation of this invention.

[Drawing 3] The control circuit Fig. showing the gestalt of 1 implementation of this invention.

[Drawing 4] The operation flow chart which shows the gestalt of 1 implementation of this invention.

[Description of Notations]

1 Oil-Temperature Detector, 3 Oil-Temperature Rise Driving Device, 4 Oil-Temperature Rise Value Detection Means, 5 A motor rotational-speed adjustment means, 6 An environmental condition setting means, 7 Abnormality distinction means, 8 A motor driving gear, 9 A motor, 16 An oil tank, 17 Hydraulic pump, 18 An electromagnetic clutch, 26 An oil-temperature detection relay, 27 Oil-temperature rise time limiting relay, 28 The Nighttime detection contact, 29 An extended time limiting relay, 30 Malfunction detection relay contact, 31 Oil-temperature rise equipment, S8 oil-temperature rise value detection means, S9 An abnormality distinction means, S10 An abnormal-stop command means, S12, S14-S17 A motor rotational-speed adjustment means, S13 Environmental condition setting means.

[Translation done.]

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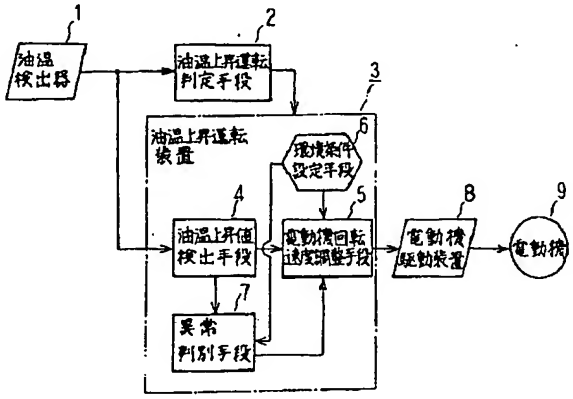
(54)【発明の名称】　油圧エレベーターの油温上昇運転装置

(57)【要約】

【課題】　油圧エレベーターで油温上昇運転させても、室温が低い場合は、油温がさほど上昇しないところで運転が終了することがある。

【解決手段】　油温検出器１は油温を検出し、油温上昇値検出手段４で油温上昇値を検出する。電動機回転速度調整手段５は油温上昇値に基づいて電動機９の回転速度を制御する。また、環境条件設定手段６の設定により、夜間は電動機９の回転速度を１／２にし、２倍の時間かけて制御する。

【効果】　室温の影響を受けず油温上昇でき、周囲環境に悪影響を与えない。



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【特許請求の範囲】

【請求項１】　油タンク内に浸漬された電動機により油圧ポンプを可変速運転して油圧エレベーターのかごを昇降させ、上記油中に設置された油温検出器が所定値以下の油温を検出すると、上記電動機を上記油圧ポンプから切り離して駆動して上記油温を上昇させる装置において、上記油温上昇運転中の油温上昇値に基づいて上記電動機の回転速度を制御する電動機回転速度調整手段を備えたことを特徴とする油圧エレベーターの油温上昇運転装置。

【請求項２】　油温上昇運転時の電動機の回転速度を変更させる環境条件を設定する環境条件設定手段を設けたことを特徴とする請求項１記載の油圧エレベーターの油温上昇運転装置。

【請求項３】　油温上昇運転時の電動機の回転速度を、通常の油温上昇運転時よりも低い値にさせる環境条件を設定する環境条件設定手段を設けたことを特徴とする請求項１記載の油圧エレベーターの油温上昇運転装置。

【請求項４】　油温上昇運転時の電動機の回転速度を、通常の油温上昇運転時よりも低い値にし、かつ上記通常の油温上昇運転時よりも長時間にする環境条件を設定する環境条件設定手段を設けたことを特徴とする請求項１記載の油圧エレベーターの油温上昇運転装置。

【請求項５】　油温上昇運転中の油温上昇値が所定範囲外になると上記油温上昇運転の異常と判別する異常判別手段を設けたことを特徴とする請求項１記載の油圧エレベーターの油温上昇運転装置。

【請求項６】　異常判別手段が異常を判別すると、電動機を停止させる指令を出力する異常停止指令手段を設けたことを特徴とする請求項５記載の油圧エレベーターの油温上昇運転装置。

【請求項７】　油タンク内に浸漬された電動機により油圧ポンプを可変速運転して油圧エレベーターのかごを昇降させ、上記油中に設置された油温検出器が所定値以下の油温を検出すると、上記電動機を上記油圧ポンプから切り離して駆動して上記油温を上昇させる装置において、上記油温上昇運転中の油温上昇値を検出する油温上昇値検出手段と、上記検出された油温上昇値により上記電動機の回転速度の指令値を変更する電動機回転速度調整手段とを備えたことを特徴とする油圧エレベーターの油温上昇運転装置。

【請求項８】　油タンク内に浸漬された電動機により油圧ポンプを可変速運転して油圧エレベーターのかごを昇降させ、上記油中に設置された油温検出器が所定値以下の油温を検出すると、上記電動機を上記油圧ポンプから切り離して駆動して上記油温を上昇させる装置において、上記油温上昇運転中の油温上昇値を検出する油温上昇値検出手段と、上記油温上昇運転時の上記電動機の回転速度を変更させる環境条件を設定する環境条件設定手段と、上記検出された温度上昇値及び上記設定された環境条件に従って上記電動機の回転速度の指令値を変更する電動機回転速度調整手段と、上記油温上昇運転中の油温上昇値が所定範囲外になると上記油温上昇運転の異常と判別するとともに、上記設定された環境条件に従って上記所定範囲を変更する異常判別手段とを備えたことを特徴とする油圧エレベーターの油温上昇運転装置。

2

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、油圧エレベーターを駆動する油の温度低下時に、油温上昇運転を実施する装置に関するものである。

【０００２】

【従来の技術】一般に油圧エレベーターでは、油の温度が変わると、油の粘度が変化し、油温が低下すると粘度は高くなる。これにより、油圧ポンプ等の機器の損傷を招いたり、油圧ポンプの漏れ量や機械効率が変化して電動機への負荷トルク及び逆止弁の応答速度が変動したりする。このため、油温が低い場合には、一定時間油温上昇装置を動作させて、油温を上昇させる手段が講じられている。

【０００３】近年、半導体の技術進歩に伴い、電圧及び周波数を変化させて、誘導電動機の回転速度を広い範囲にわたって制御する方式が広く採用されている。この電動機回転速度制御方式による油温上昇運転をする油温上昇装置が、例えば特開平３－１５８３７５号公報に開示されている。これは、誘導電動機の油圧ポンプとを電磁クラッチで連結し、通常運転時は電磁クラッチを介して油圧ポンプの回転速度を制御し、油温低下時は、電磁クラッチを遮断することによって誘導電動機だけを駆動し、電動機の発熱及び油の回転損失エネルギーを利用して油温を上昇させるものである。

【０００４】

【発明が解決しようとする課題】上記のような従来の油圧エレベーターの油温上昇運転装置では、低温が検出されると、一定時間油温上昇装置を動作させるようにしている。しかし、夜間や冬季などの室温が低いときには、室温が高いときに比べ、油温は上昇しにくく、油温上昇装置を動作させても、低温検出レベルからさほど油温は上昇しないままで、油温上昇運転を終了する。また、エレベーターを休止したときには、油温が下がりやすいため、短時間に何回も油温上昇運転を繰り返すという問題点がある。

【０００５】また、夜間の場合、油温上昇運転を繰り返すと、電動機の回転音、電磁接触器の動作音などの騒音が居室に影響を与えるという問題点がある。一方、油温検出器が低温を検出した状態で故障すると、油温上昇運転は継続され、逆に油温が高温になり過ぎて、油圧回路機器に損傷を与えるという問題点がある。

【０００６】この発明は上記問題点を解消するためになされたもので、安定した油温上昇運転をすることがで

き、かつ夜間などには静粛な油温上昇運転をすることができるようにした油圧エレベーターの油温上昇運転装置を提供することを目的とする。

【０００７】

【課題を解決するための手段】この発明の第１発明に係る油圧エレベーターの油温上昇運転装置は、低温検出時油圧ポンプから切り離された電動機の回転速度を、油温上昇運転中の油温上昇値に基づいて制御するようにしたものである。

【０００８】また、第２発明に係る油圧エレベーターの油温上昇運転装置は、第１発明のものにおいて、油温上昇運転時の電動機の回転速度を、環境条件によって変更するようにしたものである。

【０００９】また、第３発明に係る油圧エレベーターの油温上昇運転装置は、第１発明のものにおいて、油温上昇運転時の電動機の回転速度を、環境条件によって通常の油温上昇運転時よりも低い値にさせるようにしたものである。

【００１０】また、第４発明に係る油圧エレベーターの油温上昇運転装置は、第１発明のものにおいて、油温上昇運転時の電動機の回転速度を、環境条件によって通常の油温上昇運転時よりも低い値にして長時間にするようにしたものである。

【００１１】また、第５発明に係る油圧エレベーターの油温上昇運転装置は、第１発明のものにおいて、油温上昇運転中の油温上昇値が所定範囲外になると、油温上昇運転の異常と判別するようにしたものである。

【００１２】また、第６発明に係る油圧エレベーターの油温上昇運転装置は、第５発明のものにおいて、油温上昇運転の異常が判別されると、電動機を停止させるようにしたものである。

【００１３】また、第７発明に係る油圧エレベーターの油温上昇運転装置は、油温上昇運転中の油温上昇値を検出し、油圧ポンプから切り離された電動機の回転速度の指令値を、上記検出された油温上昇値により変更するようにしたものである。

【００１４】また、第８に係る油圧エレベーターの油温上昇運転装置は、油温上昇運転中の油温上昇値を検出し、油圧ポンプから切り離された電動機の回転速度の指令値を、上記検出された油温上昇値及び設定された環境条件に従って変更し、油温上昇値が所定範囲外になると、油温上昇運転の異常と判別するとともに、設定された環境条件に従って上記所定範囲を変更するようにしたものである。

【００１５】

【発明の実施の形態】図１～図４はこの発明の一実施の形態を示す図で、図１は要部機能構成図、図２は全体構成図、図３は制御回路図、図４は動作フローチャートであり、図中、同一符号は同一部分を示す。

【００１６】図１において、１は油圧エレベーターの油タンク１６（図２）内に設けられた油温検出器、２は油温検出器１に接続され油温上昇値に基づいて油温上昇運転の実施を判定する油温上昇運転判定手段、３は油温上昇運転を実施する油温上昇運転装置、４は油温検出器１からの油温データを所定時間前の油温データと比較して油温上昇値を検出する油温上昇値検出手段、５は油温上昇値検出手段４からの油温上昇値により油温上昇運転中の電動機の回転速度を指令する電動機回転速度調整手段である。

【００１７】６は現在の油圧エレベーターの環境状況、例えば油温上昇運転を実施する時間が静粛を必要とする夜間であるかなどの環境条件を設定して電動機回転速度調整手段５へ出力する環境条件設定手段、７は油温上昇値検出手段４から出力される油温上昇値、及び環境条件設定手段６から出力される環境条件に基づいて異常の有無を判断して電動機回転速度調整手段５へ指令を送出する異常判別手段、８は電動機回転速度調整手段５の指令により、図２に示す電動機９を駆動する電動機駆動装置である。

【００１８】図２において、Ｒ，Ｓ，Ｔは三相交流電源、１１は三相交流を直流に変換するコンバータ、１２はコンバータ１１の直流側に接続された平滑コンデンサ、１３は平滑コンデンサ１２に接続され直流を可変電圧・可変周波数の三相交流に変換するインバータ、１４はインバータ１３からの回生電力を交流電源Ｒ，Ｓ，Ｔへ返す回生用コンバータ、１５はインバータ１３と電動機９の間に挿入され、インバータ１３の出力を投入・遮断する主接点である。

【００１９】１６は油圧エレベーター駆動用の油を蓄える油タンクで、電動機９及び油温検出器１は油タンク１６の油中に浸漬されている。１７は電動機９に電磁クラッチ１８を介して結合された油圧ポンプ、１９は油圧ポンプ１７に配管で接続されソレノイド１９ａで駆動されて油の流れを制御する電磁弁、２０は電磁弁１９から油圧シリンダ（図示しない）に接続された配管、２１はマイクロコンピュータで構成された運転制御装置で、電磁クラッチ１８、ソレノイド１９ａ及び油温検出器１に接続されている。

【００２０】図３において、＋，－は直流制御電源、２５ａは油温上昇運転判定手段２の出力により動作し、所定の低温が検出されると閉成する低温検出接点、２５ｂは同じく開放する低温検出接点、２６は低温検出リレーで、２６ａ，２６ｂはその常開接点、２６ｃは同じく常閉接点、２７は限時復帰形の油温上昇時限リレーで、２７ａ，２７ｂはその常開接点、２８は夜間に閉成する夜間検出接点、２９は限時復帰形の延長時限リレーで、２９ａはその常開接点である。

【００２１】３０は常時閉成しており、異常判別手段７で異常を判別すると開放する異常検出リレー接点、３１は油温上昇運転装置３に相当する油温上昇装置である。

【００２２】次に、この実施の形態の動作を説明するが、まず通常時の動作を図２によって説明する。通常時、電磁クラッチ１８は運転制御装置２１からの指令により付勢されて動作し、電動機９と油圧ポンプ１７とは結合されている。起動時主接点１５が付勢され、またインバータ１３に制御指令が与えられると、コンバータ１１で直流に変換され、インバータ１３で交流に変換された電力が電動機９に供給される。

【００２３】これで、電動機９は電磁クラッチ１８を介して油圧ポンプ１７を駆動し、油タンク１６内の油は、電磁弁１９及び配管２０を通って油圧シリンダへ供給されてかご（図示しない）を上昇させる。かごの下降時は、運転制御装置２１からの指令により、ソレノイド１９ａが付勢され、電磁弁１９は油の流路を切り換える。これで、油圧シリンダから油が油タンク１６へ戻されて、かごを下降させる。そして、かごの上昇及び下降時、所定の走行パターンに応じて電動機９の回転速度が制御されることにより、かごの昇降速度が制御される。

【００２４】次に、油温上昇運転時の動作を図１～図３によって説明する。ステップＳ１で前回測定された油温検出器１からの油温ＴＨを前回油温ＴＨＢとし、今回の入力値を新しく油温ＴＨに設定する。ステップＳ２で油温ＴＨが油温上昇開始温度以下かを判定し、以下であればステップＳ３へ進んで低温検出接点２５ａを閉成し、越えていればステップＳ４へ進んで低温検出接点２５ａを開放する。

【００２５】ステップＳ５で低温検出リレー２６が付勢されているかを判定する。油温が低い場合はステップＳ３で低温検出接点２５ａが閉成するので、低温検出リレー２６は付勢され、接点２６ａ，２６ｂは閉成し、接点２６ｃは開放する。一方、油温上昇時限リレー２７は、通常時（＋）－（２５ｂ）－（２６ｃ）－（２７）－（－）の回路で付勢されており、接点２７ａ，２７ｂは閉成している。このため、接点２６ａの閉成により低温検出リレー２６は自己保持される。また、接点２６ｃの開放により、油温上昇時限リレー２７は消勢されて時限のカウントを開始する。この時限は油温を上昇させるのに必要な時間に設定されている。

【００２６】また、異常検出リレー接点３０は閉成しているため、接点２６ｂが閉成すると、油温上昇装置３１が動作する。すなわち、運転制御装置２１は電磁クラッチ１８を消勢するため、電動機９は油圧ポンプ１７から切り離されて回転する。これで、電動機９の発熱及び油の回転損失エネルギーにより、油温は次第に上昇する。これが油温上昇運転である。そして、所定時間が経過すると、油温上昇時限リレー２７は復帰して接点２７ａは開放する。

【００２７】このとき、油温が油温上昇開始温度よりも高ければ、低温検出接点２５ａも開放しているので、低温検出リレー２６は消勢し、接点２６ａ，２６ｂは開放し、接点２６ｃは閉成する。接点２６ｂの開放により、油温上昇装置３１は不動作となり、電動機９は停止して油温上昇運転は終了する。

【００２８】さて、ステップＳ５で低温検出リレー２６が消勢されていると判定されると、油温上昇運転は行われず、ステップＳ１８へ進み、初期設定として初期値フラグＳＹＯＫＩを「０」に設定する。低温検出リレー２６が付勢されている場合はステップＳ６へ進み、油温上昇処理の初期かを判定する。初期であれば、初期値フラグＳＹＯＫＩは「０」のため、ステップＳ７へ進み、回転速度Ｎをαに初期設定し、初期値フラグＳＹＯＫＩを「１」に設定する。αは例えば図４のフローチャートを１分ごとに処理することとし、１０分間に油温１５℃（油温上昇開始温度）から２５℃まで上昇させるのに必要な回転速度である。その後、ステップＳ１３へ進む。

【００２９】ステップＳ６で初期値フラグＳＹＯＫＩが「１」であれば、ステップＳ８へ進み、今回の油温ＴＨと前回の油温ＴＨＢとの差を演算して温度上昇値ＴＨＤとする。ステップＳ９で温度上昇値ＴＨＤが所定値ＴＨＳ（例えば零）よりも低いかを判定し、低ければ油温上昇運転をしているにもかかわらず油温が上昇していないため、油温検出器１等の故障と判断する。そして、ステップＳ１０へ進んで異常検出リレー接点３０を開放する。これで、油温上昇装置３１は不動作となり油温上昇運転は終了する。

【００３０】ステップＳ９で温度上昇値ＴＨＤが所定値ＴＨＳ以上であれば、ステップＳ１１へ進み、異常検出リレー接点３０を閉成して、油温上昇運転を継続する。次に、ステップＳ１２へ進み、電動機９の回転速度Ｎを（１／ＴＨＤ）×Ｎによって演算する。例えば第１周期（例えば１分）で１℃上昇すれば、温度上昇値ＴＨＤは１で回転速度Ｎはαとなる（初期値はＮ＝α）。第２周期で温度上昇値ＴＨＤが０．５であれば、第１周期の回転速度を２倍した値が第２周期での回転速度（２×α）とする。

【００３１】ステップＳ１３で夜間の時間帯かを判断し、夜間でないときはステップＳ１４へ進み、夜間検出接点２８を開放し、ステップＳ１５で電動機９の回転速度をＮに設定し、所定値ＴＨＳをβ（温度上昇の確認用所定値）に設定する。次に、夜間の時間帯では、エレベーターの使用頻度は小さい。また、機械室の近くに居室がある場合、電動機９の回転音、電磁接触器の動作音などの騒音が心配される。そこで、ステップＳ１３で夜間の時間帯と判断されると、ステップＳ１６へ進み、夜間検出接点２８を閉成し、ステップＳ１７で電動機９の回転速度Ｎを１／２に設定して制御する。また、所定値ＴＨＳをβ／２に設定する。

【００３２】これは、夜間電動機９の回転速度Ｎを１／２にすると、温度上昇値ＴＨＤも１／２になるため、ステップＳ９，Ｓ１０で異常検出することを防止するもの

である。また、夜間検出接点２８の閉成により、（＋）－（２７ｂ）－（２８）－（２９）－（－）の回路で、延長時限リレー２９が付勢され、接点２９ａが閉成する。これで、低温検出リレー２６は自己保持を継続する。すなわち、油温上昇時限リレー２７は設定時限が満了すると不動作となり、接点２７ａは開放するが、接点２９ａの閉成により低温検出リレー２６は消勢されない。

【００３３】これで、油温上昇装置３１は動作を継続し、油温上昇制限時間は延長され、夜間は昼間の時間帯の半分の回転速度で、２倍の時間をかけて油温上昇運転を行うことにより、電動機９の回転音及び電磁接触器の動作回数も半減し、周囲環境に与える騒音は低減する。ここで、ステップＳ８は油温上昇値検出手段４を、ステップＳ９は異常判別手段７を、ステップＳ１０は異常停止指令手段を、ステップＳ１２，Ｓ１４～Ｓ１７は電動機回転速度調整手段５を、ステップＳ１３は環境条件設定手段６を構成している。

【００３４】図１のステップＳ９では温度上昇値ＴＨＤが所定値ＴＨＳよりも小さいときを異常と判別するものとしたが、温度上昇値ＴＨＤが所定範囲よりも小さいとき及び大きいとき、共に異常と判別するようにすれば、更に望ましいものとなる。また、上記実施の形態では、リレー回路を含めた構成で説明したが、すべてソフトウェアで構成することも可能であり、同様の効果が得られることは明白である。また、図１のステップＳ２の油温上昇開始温度を環境条件設定手段６で設定された条件に従って変更することも可能である。

【００３５】

【発明の効果】以上説明したとおりこの発明の第１発明及び第７発明では、電動機の回転速度を油温上昇値に基づいて制御するようにしたため、室温の影響を受けずに、油温を一定時間で一定温度まで上昇させることができる効果がある。

【００３６】また、第２発明では、油温上昇運転時の電動機の回転速度を、環境条件によって変更するようにしたため、周囲環境に悪影響を与えない油温上昇運転を行うことができる効果がある。

＊【００３７】また、第３発明では、油温上昇運転時の電動機の回転速度を、環境条件によって通常の油温上昇運転時よりも低い値にし、第４発明では更に長時間にするようにしたため、電動機の回転音及び電磁接触器の動作回数を軽減して、夜間等でも静粛な環境を保つことができる効果がある。

【００３８】また、第５発明では、油温上昇運転中の油温上昇値が所定範囲外になると、油温上昇運転の異常と判別するようにしたため、油温検出器、油温上昇装置等の異常を検出することができる効果がある。

【００３９】また、第６発明では、油温上昇運転の異常が判別されると、電動機を停止させるようにしたため、むだな油温上昇運転をしたり、機器を損傷させたりすることを防止することができる効果がある。

【００４０】また、第８発明では、油温上昇運転時の電動機の回転速度を、油温上昇値及び環境条件に従って変更し、油温上昇値が所定範囲外になると、油温上昇運転の異常と判別するとともに、環境条件に従って異常判別の範囲を変更するようにしたため、更に安定した油温上昇運転を実現することができる効果がある。

【図面の簡単な説明】

【図１】　この発明の一実施の形態を示す要部機能構成図。

【図２】　この発明の一実施の形態を示す全体構成図。

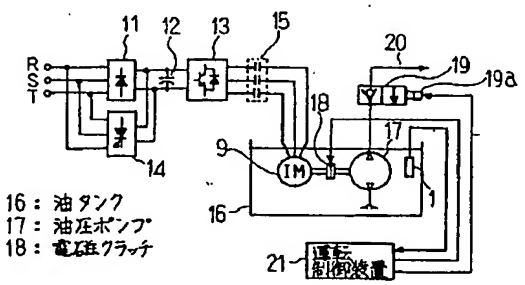
【図３】　この発明の一実施の形態を示す制御回路図。

【図４】　この発明の一実施の形態を示す動作フローチャート。

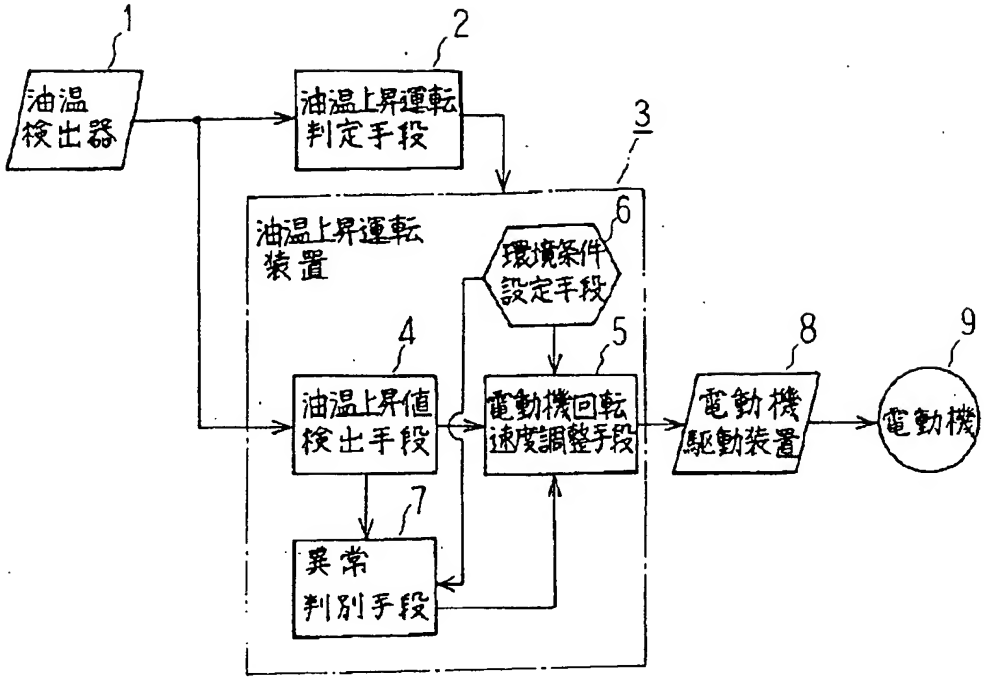
【符号の説明】

１　油温検出器、３　油温上昇運転装置、４　油温上昇値検出手段、５　電動機回転速度調整手段、６　環境条件設定手段、７　異常判別手段、８　電動機駆動装置、９　電動機、１６　油タンク、１７　油圧ポンプ、１８　電磁クラッチ、２６　油温検出リレー、２７　油温上昇時限リレー、２８　夜間検出接点、２９　延長時限リレー、３０　異常検出リレー接点、３１　油温上昇装置、Ｓ８油温上昇値検出手段、Ｓ９　異常判別手段、Ｓ１０　異常停止指令手段、Ｓ１２，Ｓ１４～Ｓ１７　電動機回転速度調整手段、Ｓ１３　環境条件設定手段。

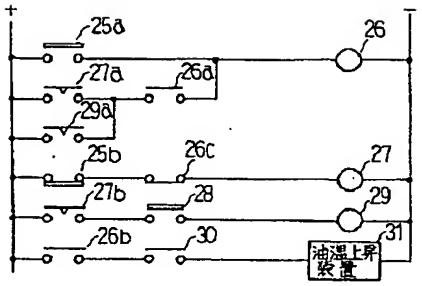
【図２】



【図１】



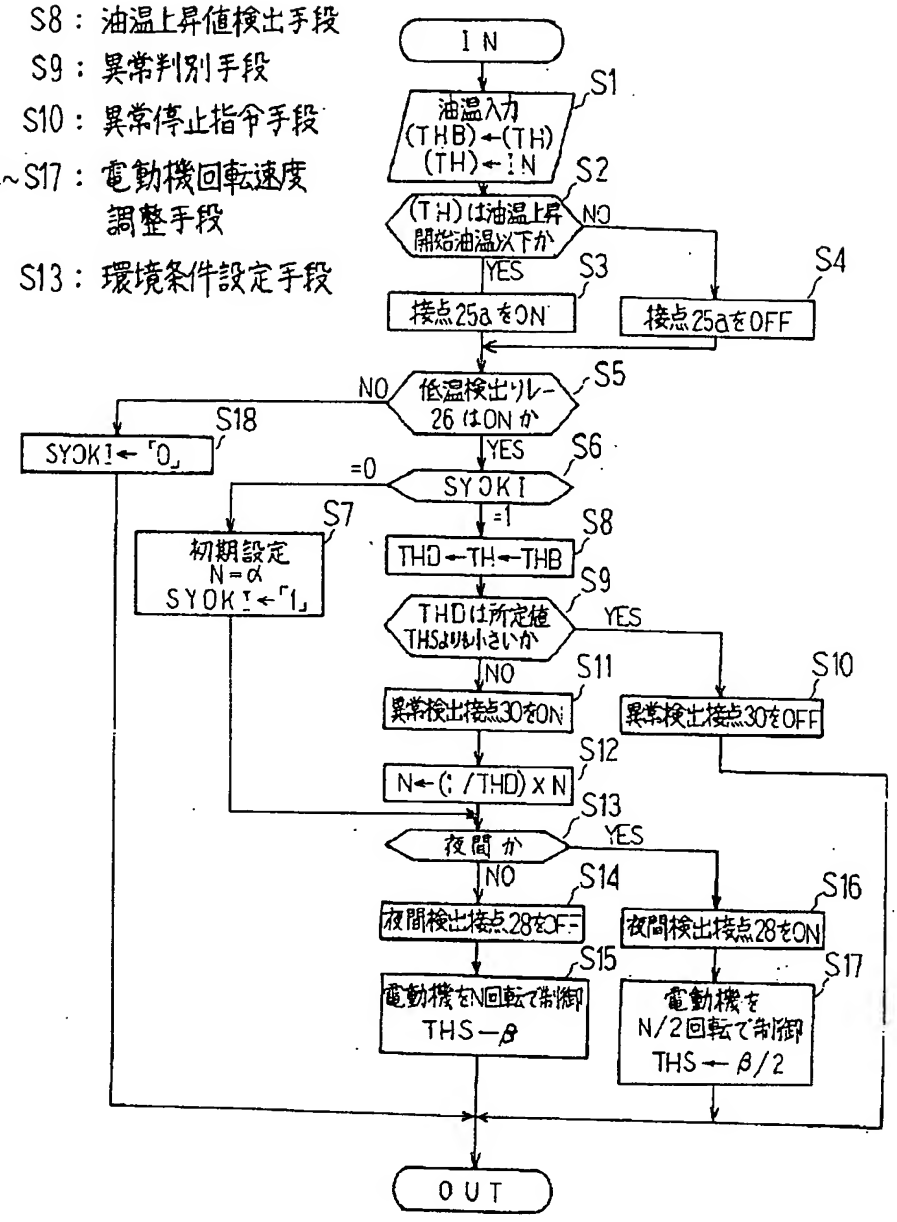
【図３】



26：油温検出リレー
27：油温上昇時限リレー
28：夜間検出接点
29：延長時限リレー
30：異常検出リレー接点

【図４】

S8：油温上昇値検出手段
S9：異常判別手段
S10：異常停止指令手段
S12, S14～S17：電動機回転速度調整手段
S13：環境条件設定手段



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